AVIRAL CLASSES

IIT-JEE | NEET | FOUNDATIONS

ULTIMATE TEST SERIES NEET -2020
XII TEST-1 SOLUTION

Test Date :17-03-2020

[PHYSICS]

1. $y = 5x^2 - 2x + 1$

$\frac{dy}{dx} = 10x - 2 \qquad 10x - 2 = 0 \qquad x = \frac{1}{5}$

$\frac{d^2y}{dx^2} = 10 \qquad y_{min} = 5\left(\frac{1}{5}\right)^2 - 2\left(\frac{1}{5}\right) + 1 = \frac{4}{5}$

2. $S_{n^{th}} = u + \frac{a}{2}(2n - 1)$

$S_{3^{rd}} = 10 + \frac{10}{2}(2 \times 3 - 1) = 10 + 25 = 35$ m

$S_{2^{nd}} = 10 + \frac{10}{2}(2 \times 2 - 1) = 10 + 15 = 25$ m

$S_{3^{rd}} : S_{2^{nd}} :: 7 : 5$

3. $\frac{dr}{dt} = 0.1 \qquad A = \pi r^2$

$\frac{dA}{dt} = 2\pi r \cdot \frac{dr}{dt} = \frac{2\pi \times 5}{11} \times 0.1$

$= 0.29$ cm²/sec

4. **C** In addition least number of decimal points is taken.

5. $x = 3t^2 - 6t \qquad y = t^2 - 2t$

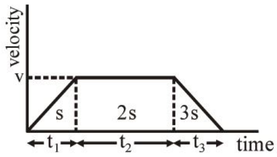
$v_x = \frac{dx}{dt} = 6t - 6 \qquad v_y = \frac{dy}{dt} = 2t - 2$

at t = 1 sec → $v_x = 0$ and $v_y = 0$

hence $v = \sqrt{v_x^2 + v_y^2} = 0$

6. Energy per unit volume, force per unit area and product of voltage & charge, per unit volume all has dimensions $[M^1L^{-1}T^{-2}]$ but angular momentum per unit mass has dimensions $[M^0L^2T^{-1}]$

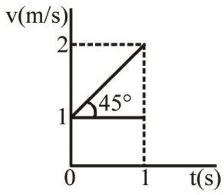
7. $v_{avg} = \frac{6s}{t_1 + t_2 + t_3}$



$v_{avg} = \frac{6s}{\frac{2s}{v} + \frac{2s}{v} + \frac{6s}{v}}$

$v_{avg} = \frac{6s \times v}{10s} \Rightarrow \frac{v_{avg}}{v} = \frac{3}{5}$

8. $v_{avg} = \frac{\text{distance}}{\text{time}}$



$v_{avg} = \frac{\frac{1}{2}(1 + 2) \times 1}{1}$

$= \frac{3}{2} = 1.5$ m/s

9. $R = 2a\cos\frac{\theta}{2} \qquad 1 = 2 \times 1 \cos\frac{\theta}{2}$

$\theta = 120°$

$R^1 = 2a \sin\frac{\theta}{2} = 2 \times 1 \sin 60° = \sqrt{3}$

10. Let $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = \hat{i} + \hat{j}$

Component of $\vec{A}$ in direction of $\vec{B} = \frac{(\vec{A} \cdot \vec{B})\vec{B}}{B^2}$

$= \frac{(2 \times 1 + 3 \times 1)(\hat{i} + \hat{j})}{2} = \frac{5}{2}(\hat{i} + \hat{j})$

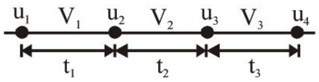
Magnitude of component $= \frac{5}{\sqrt{2}}$

11. $R = 2a\cos\frac{\theta}{2} \qquad F = 2F\cos\frac{\theta}{2}$

$\theta = 120°$

12. $t = \frac{150 + 850}{45 \times \frac{5}{18}} = 80$ sec

13.



$V_1 = \frac{u_1+u_2}{2}$, $V_2 = \frac{u_2+u_3}{2}$, $V_3 = \frac{u_3+u_4}{2}$

$V_1 - V_2 = \frac{u_1-u_3}{2}$

$V_2 - V_3 = \frac{u_2-u_4}{2} \Rightarrow \frac{V_1-V_2}{V_2-V_3} = \frac{u_1-u_3}{u_2-u_4}$

$t_1 = \frac{u_2-u_1}{a}$, $t_2 = \frac{u_3-u_2}{a}$, $t_3 = \frac{u_4-u_3}{a}$

$t_1 + t_2 = \frac{u_3-u_1}{a}$

$t_2 + t_3 = \frac{u_4-u_2}{a} \Rightarrow \frac{t_1+t_2}{t_2+t_3} = \frac{u_3-u_1}{u_4-u_2} = \frac{u_1-u_3}{u_2-u_4}$

so $\frac{V_1-V_2}{V_2-V_3} = \frac{t_1+t_2}{t_2+t_3}$

14. **C**

15. **B** $\vec{A}.(\vec{A}+\vec{B}) = \vec{A}.\vec{A} + \vec{A}.\vec{B} = A^2 + 0 = A^2$

$\left|\vec{a}+\vec{b}\right|$ maximum = $\left|\vec{a}\right| + \left|\vec{b}\right|$

16. **B**

17. $F = \frac{1}{4\pi\varepsilon_0}\frac{q_1q_2}{r^2} \Rightarrow [\epsilon_0] = \left[\frac{q^2}{Fr^2}\right]$

18. $a = v\frac{dv}{dx}$

19. m = linear density = $\frac{M}{L}$

$[B] = \left[\frac{A}{m}\right] = \left[\frac{F}{M/L}\right] = \left[\frac{FL}{M}\right]$ = dimensions of latent heat

20. **A** (Energy = power × time)

21. V = slope of x - t graph

If sign of v changes, then direction reverses.

if v↑, then a > 0 and if v↓, then a < 0

22. two values of acceleration, velocity or displacement. at one particle time are not possible but two velocities are possible at one value of displacement.

23. $h = \frac{1}{2}gt^2 \Rightarrow g = \frac{2h}{t^2}$

then $\frac{\Delta g}{g}\times 100 = \left(\frac{\Delta h}{h} + 2\frac{\Delta t}{t}\right)\times 100 = e_1 + 2e_2$

24. $v = at + \frac{b}{t+c} \Rightarrow [c] = [t] = T$;

$[v] = [at] \Rightarrow [a] = \frac{[v]}{[t]} = LT^{-2}$;

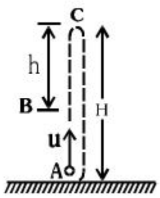
$[b] = (LT^{-1})T = L$

25. Let time of flight be T then $T = \frac{u}{g}$

Let h be the distance covered during last 't' second of its ascent

Velocity at point B = $v_B = u - g(T - t)$

$= u - g\left(\frac{u}{g} - t\right) = gt$



$\Rightarrow h = v_Bt - \frac{1}{2}gt^2$

$\Rightarrow h = gt^2 - \frac{1}{2}gt^2 = \frac{1}{2}gt^2$

26. $(\vec{A}+\vec{B}).(\vec{A}-\vec{B}) = 0$

$\Rightarrow A^2 - \vec{A}.\vec{B} + \vec{B}.\vec{A} - B^2 = 0$

$\Rightarrow A = B$ ($\because \vec{A}.\vec{B} = \vec{B}.\vec{A}$)

27. B

28. $\frac{3}{v_{avy}} = \frac{1}{v} + \frac{1}{2v} + \frac{1}{3v}$

29. For avoiding collision: $v_r < 0$

$U_r^2 + 2a_rS_r < 0$ [III Eq. in of motion]

$(V_1 - V_2)^2 + 2(-a)\, d < 0$

$(V_1 - V_2)^2 < 2ad$

$d > \frac{(v_1 - v_2)^2}{2a}$

30. As [Energy] = [Force × distance]

$\text{so unit of distance} = \frac{\text{unit of Energy}}{\text{unit of force}} = \frac{5J}{10N} = 0.5m$

31. Component of $\vec{x}$ on $\vec{y}$ = xcosθ

$= \frac{\vec{x}\cdot\vec{y}}{y} = \frac{(\vec{a}-\vec{b})\cdot(\vec{a}+\vec{b})}{|\vec{a}+\vec{b}|}$

$= \frac{a^2 - b^2}{\sqrt{a^2 + b^2}}$

32. $\vec{v}_B = 2\vec{v}_A$

$\vec{v}_{CA} = x\hat{i} \Rightarrow \vec{v}_C - \vec{v}_A = x\hat{i}$ ... (1)

$\vec{V}_c - \vec{V}_B = x\hat{j}\ \vec{V}_B - \vec{V}_A = x(\hat{i} - \hat{j})$

$\vec{V}_A = x\hat{i} - \hat{j})$

$\vec{V}_c = 2x\hat{i} - x\hat{j}$ tan θ = 1/2

33. B

34. $\frac{\Delta p}{p} = 3\frac{\Delta a}{a} + 2\frac{\Delta b}{b} + \frac{1}{2}\frac{\Delta c}{c} + \frac{\Delta d}{d}$

$= 3 \times 1\% + 2 \times 3\% + \frac{1}{2} \times 4\% + 2\% = 13\%$

35. A

36. C

37. D

38. B

39. C

40. C

41. B

42. A

43. Unit of impulse × time = N – sec^2

44. $\overrightarrow{AB} + \overrightarrow{AC} = (\overrightarrow{AO} + \overrightarrow{OB}) + (\overrightarrow{AO} + \overrightarrow{OC})$

$= 2\overrightarrow{AO} + \overrightarrow{OB} + \overrightarrow{OC}$

$= 2\overrightarrow{AO} - \overrightarrow{OA}$

$= 2\overrightarrow{AO} - \overrightarrow{AO}$

$= 3\overrightarrow{AO}$

45. D

[CHEMISTRY]

46. $E = \frac{hc}{\lambda}$

$\lambda = \frac{hc}{E}$

$\lambda = \frac{h}{p}$

$\frac{hc}{E} = \frac{h}{p}$

$p = \frac{E}{C}$

47.

$(\bar{\nu}_1)_{He^+} = y = R_H\, 2^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$ .....(i)

$(\bar{\nu}_2)_{Li^{2+}} = R_H \times 3^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$ ......(ii)

(ii) ÷ (i)

$(\bar{\nu}_2)_{Li^{2+}} = y \times \frac{9}{4}$

48.

In a single e^- system energy of an orbital depends only upon value of n.

49.

$(COOH)_2.2H_2O \longrightarrow 2C + 6O + 6H$
0.3 mol
1 mol $(COOH).2H_2O \equiv 6$ mol O
0.3 mol $(COOH).2H_2O \equiv 0.3 \times 6$ mol O
$\equiv 1.8$ mol O

50.

$n\lambda = 2\pi r$

$$\lambda = \frac{2\pi r}{n} = \frac{2 \times 3.14 \times 0.529 \times 10^{-8} cm \times 4}{2}$$

51.

$$\frac{M \times 5}{100} = 32$$

M = 640

52.

$(I.E.)_{H_2} = -(E_1)_H = x$
$E \propto Z^2$
$\Delta E = E_5 - E_2$

53.

$$PH_3(g) \rightarrow P(s) + \frac{3}{2} H_2(g)$$

100 mL 0 mL
0 mL 150 mL
$\Delta V = 150 - 100 = 50$ mL

54.

Maximum value of $m_l = +3$
Value of $l = 3$
Value of $n = 4$

55.

$$V \propto \frac{Z}{n}$$

56.

Molecular formula = (empirical formula)$_n$

$$\therefore \quad n = \frac{78}{13} = 6$$

57.

Meq. of NaOH = 10 × 0.5 × 2 = 10

$$\therefore \quad \frac{w}{40} \times 1000 = 10$$

$$\therefore \quad w = 0.4 g$$

58. (3)

59.

$$X_{O_2} = \frac{n_{O_2}}{n_{O_2} + n_{O_3}} = 0.25$$

$$X_{O_3} = \frac{n_{O_3}}{n_{O_2} + n_{O_2}} = 0.75$$

$$\% \frac{w}{w} \text{ of } O_2 = \frac{\text{wt of } O_2}{\text{wt of } O_2 + \text{wt of } O_3} \times 100\%$$

$$\frac{w_{O_2}}{w_{O_2} + w_{O_3}} \times 100 = \frac{32}{32+144} \times 100 = \frac{32}{176} \times 100 = 18.18$$

60.

Gram equivalents of acid = Gram equivalent of base

$$\frac{17}{E_w} = .1 \times 1$$

$E_w = 170$
$M_w = 2 \times 170 = 340$

61.

$$\Delta x = \frac{h}{4\pi \times m \times \Delta v}$$

$$= \frac{6.62 \times 10^{-34} \times 100}{4 \times 3.14 \times 9.1 \times 10^{-34} \times 600 \times 0.005} = 1.92 \times 10^{-3} m$$

62.

Nuclei containing same number of neutrons are isotones.

63. D

64. D

65. $2H_2 + O_2 \longrightarrow 2H_2O$

Initial 8gm 16gm

32 gm of O_2 – 4gm H_2

16 gm of O_2 – $\frac{4}{32} \times 16$ = 2 gm

Amount of H_2 left = 6 gm

66. C

67. B

68. C

69. A

70. A

71. C

72. **C**

73. **B**

74. **C**

75. **A**

76. $H_2SO_4 + Zn \rightarrow ZnSO_4 + H_2$

$2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

77. No. of moles $= \dfrac{\text{Gram amount of substance}}{M_w}$

No. of atoms = no. of moles × N_A

Gram amount is same for all M_w is minimu for B(s)

78. $n^\circ = A - Z$

for S^{35}

$n^\circ = 35 - 16 = 19$

79. If $n = 4$

$\ell = 0$

then m = (only)

80. $5e^- + 8H^+ + MnO_4^- \longrightarrow Mn^{+2} + 4H_2O$

81. Orbital angular momentum of a p-electron is given by $= \sqrt{\ell(\ell+1)}\ \dfrac{h}{2\pi}$

$= \sqrt{1(1+1)}\ \dfrac{h}{2\pi}$

$= \sqrt{2}\ \dfrac{h}{2\pi}$

$= \dfrac{1}{\sqrt{2}}\ \dfrac{h}{\pi}$

82. No of atoms = No. of molecules × atomicity

$= 0.1 \times N_A \times 3$

$= 1.806 \times 10^{23}$

83. **A**

84. **B**

85. It is very dilute solution of NaOH

$\therefore\ [OH^-]_{total} = [OH^-]_{NaOH} + [OH^-]_{H_2O}$

$[OH^-]_{total} = 10^{-7} + 10^{-7} = 2 \times 10^{-7}$ M

86. $\dfrac{1}{\lambda} = Rz^2\left(\dfrac{1}{4} - \dfrac{1}{25}\right) = R \times 1 \times \left(\dfrac{25-4}{25\times 4}\right) = \dfrac{21R}{100}$

$\lambda = \dfrac{100}{21R}$

87. **D**

88. **A**

89. **A**

90. **B**